Compost- costs and benefits

- Composting is being considered as an end use option for a range of organics
- Benefits (costs) of composting
  - Greenhouse gas balance
  - LCA balance

Composting

- Well established practice-parameters well understood
- Low infrastructure/cost for new sites
- Appropriate for residuals directly from landfill and/or after anaerobic digestion

Feedstocks- landfill diversion

- EPA regs for landfills require gas collection 2-5 years after cell is opened
- **Gas production starts within days**
- Some cases gas collection starts more quickly
- Some cases collection is more efficient

Methane generation potential for putrescibles prior to/post initiation of gas collection

- Clean Development Mechanism (CDM)
  - Equation for decay based on material, landfill location
- MSW- DST Municipal solid waste decision support tool (RTI)
- CA Air Resources Board
  - Used CDM as basis for evaluating performance of individual landfills
- Recent publication (Themelis and Ulloa, 2007)
  - Investigated efficiencies of individual landfills in CA re waste makeup and expected CH_4 generation

Integrate

- Using CDM approach as a basis
  - in combination with
- Data from individual landfills
  - To determine
- Methane avoidance credits for landfill diversion as a portion of the evaluation of GHG benefits/costs of composting operations

GHG - Composting process

- Energy use during composting
  - Integrate knowledge of composting operations in CA with energy requirements to calculate GHG balance
  - Use prior models (ROU, Univ NSW, RTI, Brown et al.) for different systems

GHG - Composting process

- Fugitive gas release during composting
  - CDM has default release values
  - Brown et al literature review
    - Potential to make case specific estimates
    - Feedstocks
    - Moisture and climate of site location
  - Emissions likely to be negligible
    - Dry climate reduces potential for anaerobic conditions in pile
    - Concern with odors necessitates BMPs

Using Compost

- Two scenarios
- Urban model
  - Highways
  - Landscaping
- Agricultural model
  - Crop and soil specific

Urban model

- Highways/ bioswales
  - Water balance (data from TX and WA)
- Landscaping model
  - Cogger et al
    - Soil carbon increase
    - Water infiltration
    - Water holding capacity

Agricultural model

- Location and end use specific
  - Three regions
  - Likely end use counties
  - Crop report
  - Common soil type
- Model results based on 1 or 2 end use options

Transport

- Transport distance to end use sites will also be taken into account
- However- based on methane avoidance of food waste- could drive a 30 ton truck >25,000 miles

Benefits

- Water use
- Soil Carbon sequestration
- Restoration of saline/sodic soils
- Reduced use of herbicides
- Fertilizer value

Compost use

- GHG and LCA savings will be calculated based on defined type of use per scenario
  - For example, used as mulch for vineyards at an application rate of 30 tons per acre every 3 years
- This use will be based on existing literature and any local data that we are able to collect

Study areas

- Kern County- end use for Central Valley and LA area
- San Joaquin- end use for Bay area materials

Kern County- 2006

- Almonds- $494,302,000
- Grapes - $494,111,000
  - Require 58" water per year
  - Both see yield declines with soil Electrical conductivity > 2.
- Carrots- $389,735,000
- Kimberlina soil series: calcareous, loamy sand, <1% organic matter

Compost use

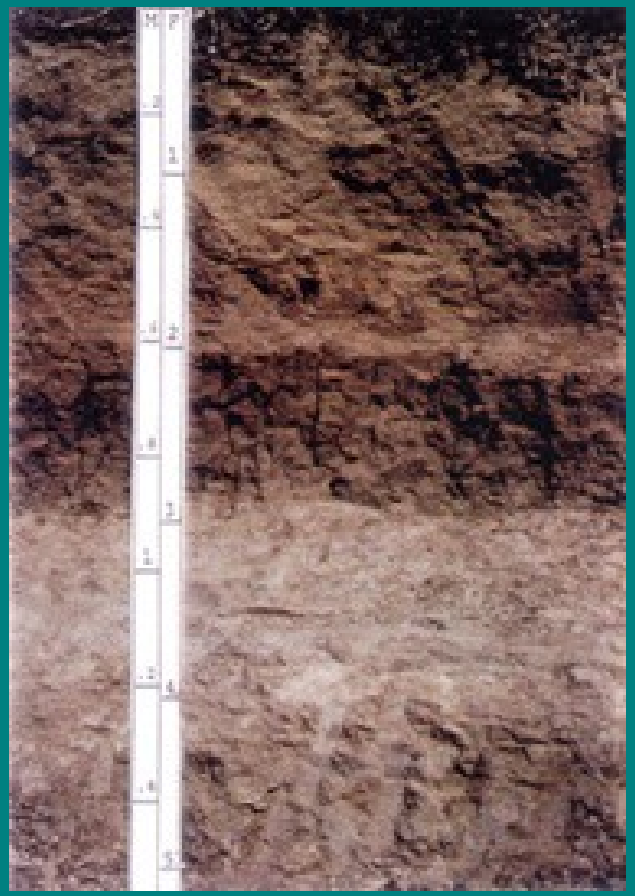
- ROU- modeled benefits based on use as a mulch on grapes
- Kern County- grapes 50% of growers apply 4 tons per acre for fertilizer, 15% apply as mulch
- More common to use higher rates for carrot and potato production

San Joaquin County- 2005

- (Milk $314,565,000)
- Grapes - $289,744,000
- Almonds - $166, 580,000
- San Joaquin soil series: fine mixed Abruptic Durixeralfs
  - Well drained, very slow permeability

San Joaquin
Fine mixed active thermic Abruptic Durixerals

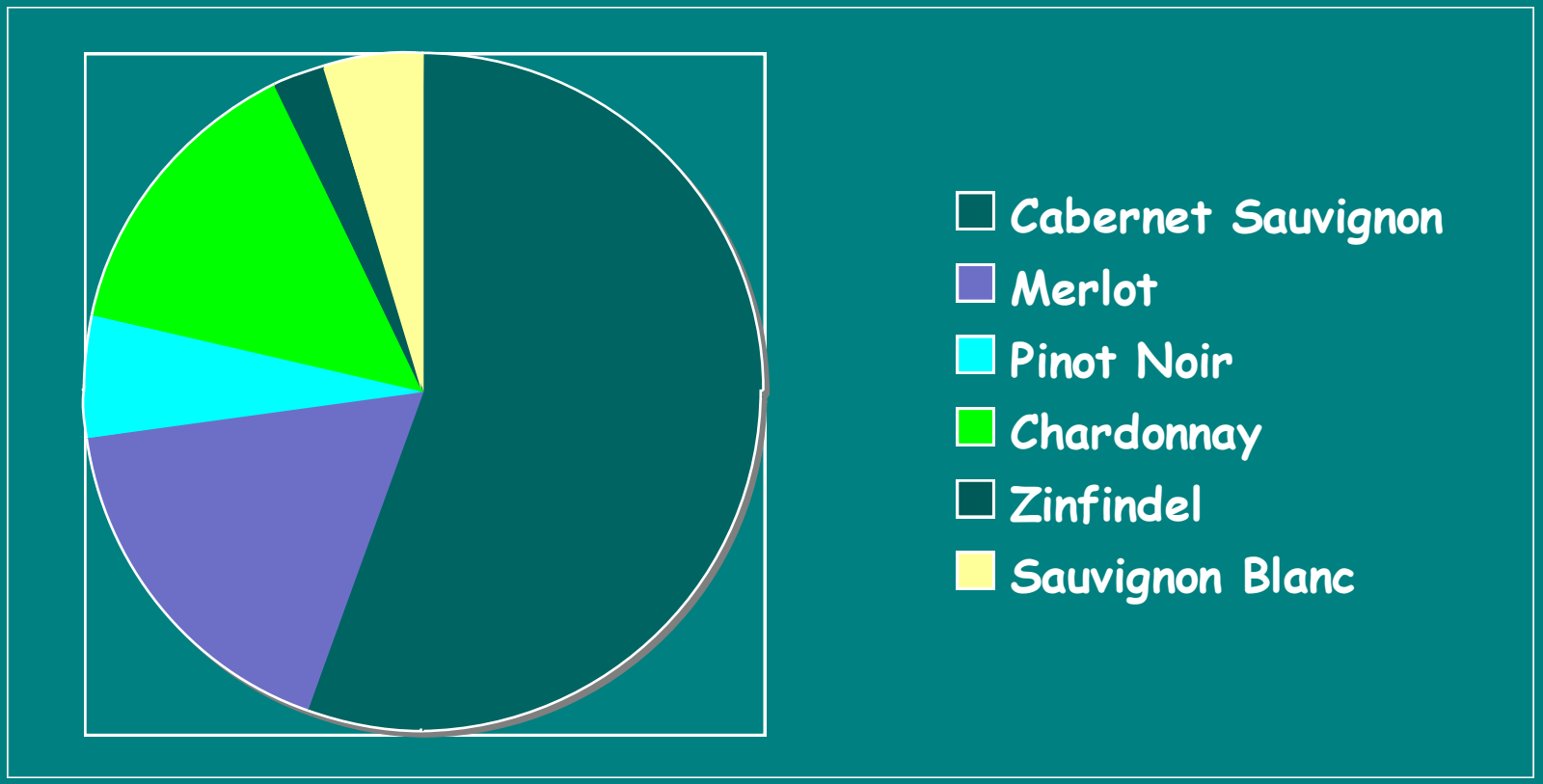
High clay soil with hard pan- impermeable layer. Would expect compost to increase organic matter, increase water infiltration capacity



Study at UC Davis- LTRAS site (Kong et al., 2005)

- Study done on an alfisol
- Saw an increase in soil carbon from 17.2 Mg C ha to 22.8 Mg C ha in rotation that included composted manure addition

Napa County- 2006
Grapes - $ 469,072,900



Local Data- Soil samples welcome

- Appropriate data (minimum information required)
  - Compost
    - Need number of applications
    - Application rate
    - Ideally how it is used
  - Control- no history of compost use